

# What is the relationship between breakfast and body weight in adults?

## Conclusion

Moderate evidence suggests that children who do not eat breakfast are at increased risk of overweight and obesity. The evidence is stronger for adolescents. There is inconsistent evidence that adults who skip breakfast are at increased risk for overweight and obesity.

## Grade

Moderate

## Evidence Summary Overview

The literature review identified six prospective cohort studies (Crossman, 2006; Merten, 2009; Niemeier, 2006; Nooyens, 2005; Purslow, 2008; van der Heijden, 2007). The studies were conducted in the US, the United Kingdom and the Netherlands. Studies ranged in sample size from 228 (Nooyens, 2005) to 20,064 (van der Heijden, 2007) and three studies included only men (Nooyens, 2005; Purslow, 2008; van der Heijden, 2007). Three studies found an inverse relationship between breakfast consumption and body weight in adults (Merten, 2009; Niemeier, 2006; Purslow, 2008). One study initially found an inverse relationship, but after adjusting for potential confounders the relationship was no longer significant (Nooyens, 2005). One study found an inverse relationship between breakfast intake and body weight in men and no relationship in women (Crossman, 2006).

The Committee did not review the literature on the use of breakfast consumption as a tool for adults actively losing weight.

## Evidence summary paragraphs:

### Cohort Studies (6)

**Crossman A et al, 2006** (positive quality) used prospective cohort data from the United States to examine the effects of adolescents' behaviors, including breakfast consumption, on their weight status six years later. Subjects were participants in the National Longitudinal Study of Adolescent Health. This study includes only respondents who participated in Wave One (1995; ages 12-18 years) and Wave Three (2001-2002; ages 18-26 years). Height and weight were self-reported at Wave One, and measured at Wave Three, and BMI and weight status were calculated. Subjects reported whether or not they eat breakfast. The final sample included 6,378 subjects (3,144 males and 3,234 females). Skipping breakfast during adolescence predicted male weight in young adulthood, but it was not significant for females. Males who

skipped breakfast during adolescence were more likely to be overweight or obese six years later (OR=1.37,  $P<0.05$ ).

**Merten M et al, 2009** (positive quality) conducted a prospective cohort study in the United States to assess breakfast consumption patterns and obesity status during adolescence and young adulthood. Subjects were participants in the National Longitudinal Study of Adolescent Health. Subjects were assessed at two developmental time points, adolescence (Wave Two) and young adulthood (Wave Three). Subjects were asked about their frequency of breakfast consumption, and subjects who reported consuming breakfast at least four days a week were considered to be regular breakfast consumers. Self-reported height and weight were used to calculate BMI, and those who were obese during both adolescence and young adulthood were considered to have chronic obesity. The final sample included 7,788 subjects with complete data from Waves Two and Three. Wave Three subjects had reached young adulthood and ranged in age between 18-26 years (mean age=22.5 years). Results showed that 43% of young adults were regular breakfast consumers. Chronic obesity was significantly associated with a decrease in the likelihood of young adult breakfast consumption (OR=0.75; 95% CI: 0.68 to 0.83). The authors concluded that regular breakfast consumption was protective against obesity.

**Niemeier H et al, 2006** (positive quality) conducted a prospective cohort study in the United States and investigated whether breakfast skipping was associated with weight during the transition from adolescence to adulthood. Subjects were participants in the National Longitudinal Study of Adolescent Health. Subjects were assessed at two developmental time points, adolescence (Wave Two) and young adulthood (Wave Three). Subjects were asked about their frequency of breakfast consumption, with responses ranging from zero to seven days per week. Measured height and weight was used to calculate body mass index (BMI). The final sample included 9,919 subjects with complete data from Waves Two and Three (Wave Two included ages 11-18 years, mean BMI=22kg/m<sup>2</sup>; Wave Three included ages 18 and 26 years, mean BMI=26kg/m<sup>2</sup>). Breakfast consumption at Wave Two predicted zBMI at Wave 3 ( $\beta$ = -0.01,  $P<0.05$ ). For each additional day of breakfast consumption during Wave Two, zBMI was predicted to decrease 0.01 at Wave Three ( $P<0.01$ ). Breakfast consumption and change in breakfast consumption accounted for 0.06% of the variance in zBMI at Wave Three. The authors concluded that breakfast skipping was associated with increased weight gain from adolescence to adulthood.


**Nooyens A et al, 2005** (positive quality) conducted a prospective cohort study in the Netherlands and examined changes in lifestyle in relation to changes in body weight associated with occupational retirement in men. Subjects were participants in the Doetinchem Cohort Study. Subjects were aged 50-65 years at baseline in 1994-1997, and were followed up five years later from 1999-2002. Body weight was measured at baseline and at the end of follow-up. Food intake was assessed using a food frequency questionnaire (FFQ). The final sample included 288 men (ages 50-65 years; mean BMI=26kg/m<sup>2</sup>). Weight gain was significantly associated with an increase in frequency of eating breakfast ( $\beta$ =0.07,  $P<0.05$ ). However, after adjusting for retirement, type of job, age, smoking and baseline variables, this relationship was no longer significant ( $\beta$ =0.04,  $P=0.21$ ).


**Purslow L et al, 2008 (positive quality)** analyzed prospective cohort data to investigate the association between percentage of total daily energy intake consumed



at breakfast and weight change. Subjects were from the European Prospective Investigation into Cancer and Nutrition-Norfolk cohort who were recruited from 1993-1997 and followed until 1998-2000. Participants completed a seven-day food diary at baseline, and measurements of height and weight taken at baseline and follow-up were used to determine BMI. The final sample included 6,764 men (ages 40-75 at baseline). Increased percentage of daily energy consumed at breakfast was associated with relatively lower weight gain (adjusted  $\beta$  coefficient= -0.021, 95% CI -0.035, -0.007; P=0.004). The authors concluded that consuming more energy from breakfast is associated with reduced long-term weight gain in adults.


**van der Heijden A et al, 2007 (positive quality)** conducted a prospective cohort study in the United States and investigated the association between breakfast consumption and long-term weight gain in adult men over a 10-year period. Subjects were participants in the Health Professionals Follow-up Study. Participants reported their weight on each biennial questionnaire, and weight change was defined as the difference between weight reported in 2002 and at baseline in 1992. Breakfast consumption was assessed using a semi-quantitative FFQ. The final sample include 20,064 men (3,386 breakfast non-consumers (mean age=54 years; mean BMI=26kg/m<sup>2</sup>) and 16,678 breakfast consumers (mean age=58 years; mean BMI=26kg/m<sup>2</sup>). Breakfast consumption was inversely associated with the risk of 5kg weight gain after adjustment for age (HR=0.77, 95% CI 0.72-0.82), and this association was independent of lifestyle and BMI at baseline (HR=0.87, 95% CI 0.82-0.93). The inverse association between breakfast consumption and weight gain was more pronounced in men with a baseline BMI of  $\leq 25\text{kg/m}^2$  (HR=0.78, 95% CI 0.70-0.87) than in men who were overweight at baseline (HR=0.92, 95% CI 0.85-1.00).


 [View table in new window](#)

Author, Year, Study Design, Class, Rating	Participants/Location	Methods	Outcome
Crossman et al. 2006  Study Design: Prospective cohort study  Class: B  Rating: 	N=6,378 subjects (3,144 males and 3,234 females).  Location: United States.	Subjects were participants in the National Longitudinal Study of Adolescent Health. This study includes only respondents who participated in Wave One (1995; ages 12-18 years) and Wave Three (2001-2002; ages 18-26 years).	Skipping breakfast during adolescence predicted male weight in young adulthood, but it was not significant for females.  Males who skipped breakfast during adolescence were more likely

		<p>Height and weight were self-reported at Wave One, measured at Wave Three, and BMI and weight status were calculated.</p> <p>Subjects reported whether or not they eat breakfast.</p>	<p>to be overweight or obese six years later (OR=1.37, P&lt;0.05).</p>
<p>Merten et al 2009</p> <p>Study Design: Prospective cohort study</p> <p>Class: B</p> <p>Rating: </p>	<p>N=7,788 subjects with complete data from Waves Two and Three. Wave Three subjects had reached young adulthood and ranged in age between 18-26 years (mean age=22.5 years).</p> <p>Location: United States.</p>	<p>Subjects were participants in the National Longitudinal Study of Adolescent Health. Subjects were assessed at two developmental time points, adolescence (Wave Two) and young adulthood (Wave Three).</p> <p>Subjects were asked about their frequency of breakfast consumption, and subjects who reported consuming breakfast at least four days a week were considered to be regular breakfast consumers.</p> <p>Self-reported height and weight were used to calculate BMI, and those who were obese during both adolescence</p>	<p>Wave Three subjects had reached young adulthood, and ranged in age between 18-26 years (mean age=22.5 years). Results showed that 43% of young adults were regular breakfast consumers.</p> <p>Chronic obesity was significantly associated with a ↓ in the likelihood of young adult breakfast consumption (OR=0.75; 95% CI: 0.68 to 0.83).</p>

		and young adulthood were considered to have chronic obesity.	
<p>Niemeier et al 2006</p> <p>Study Design: Prospective cohort study</p> <p>Class: B</p> <p>Rating: </p>	<p>N=9,919 subjects with complete data from Waves Two and Three (Wave Two included ages 11-18 years, mean BMI=22kg/m<sup>2</sup>; Wave Three included ages 18 and 26 years, mean BMI=26kg/m<sup>2</sup>).</p> <p>Location: United States.</p>	<p>Subjects were participants in the National Longitudinal Study of Adolescent Health. Subjects were assessed at two developmental time points, adolescence (Wave Two) and young adulthood (Wave Three).</p> <p>Subjects were asked about their frequency of breakfast consumption, with responses ranging from zero to seven days per week.</p> <p>Measured height and weight was used to calculate BMI.</p>	<p>Breakfast consumption at Wave Two predicted zBMI at Wave Three (<math>\beta = -0.01</math>, <math>P &lt; 0.05</math>). For each additional day of breakfast consumption during Wave Two, zBMI was predicted to <math>\downarrow</math> 0.01 at Wave Three (<math>P &lt; 0.01</math>).</p> <p>Breakfast consumption and <math>\Delta</math> in breakfast consumption accounted for 0.06% of the variance in zBMI at Wave Three.</p>
<p>Nooyens et al 2005</p> <p>Study Design: Prospective Cohort Study</p> <p>Class: B</p> <p>Rating: </p>	<p>N=288 men (ages 50-65 years; mean BMI=26kg/m<sup>2</sup>).</p> <p>Location: The Netherlands.</p>	<p>Subjects were participants in the Doetinchem Cohort Study. Subjects were aged 50-65 years at baseline in 1994-1997, and were followed up five years later from 1999-2002.</p> <p>Body weight was measured at baseline and at the</p>	<p>Weight gain was significantly associated with an <math>\uparrow</math> in frequency of eating breakfast (<math>\beta = 0.07</math>, <math>P &lt; 0.05</math>). However, after adjusting for retirement, type of job, age, smoking and baseline</p>


		end of follow-up.  Food intake was assessed using a FFQ.	... variables, this relationship was no longer significant ( $\beta=0.04$ , $P=0.21$ ).
<p>Purslow LR, Sandhu MS et al, 2008</p> <p>Study Design: Prospective Cohort Study</p> <p>Class: B</p> <p>Rating: </p>	<p>N=6,764 men (ages 40-75 years at baseline). Location: Europe.</p>	<p>Subjects were from the European Prospective Investigation into Cancer and Nutrition-Norfolk cohort who were recruited from 1993-1997 and followed until 1998-2000.</p> <p>Participants completed a seven-day food diary at baseline, and measurements of height and weight taken at baseline and follow-up were used to determine BMI.</p>	<p>↑ percentage of daily energy consumed at breakfast was associated with relatively lower weight gain (adjusted <math>\beta</math> coefficient= -0.021, 95% CI -0.035, -0.007; <math>P=0.004</math>).</p>
<p>van der Heijden AA, Hu FB et al, 2007</p> <p>Study Design: Sub-analysis of the Health Professional Follow-up Study, which was a prospective cohort study</p> <p>Class: B</p>	<p>N=20,064 men (3,386 breakfast non-consumers (mean age=54 years; mean BMI=26kg/m<sup>2</sup>) and 16,678 breakfast consumers (mean age=58 years; mean BMI=26kg/m<sup>2</sup>). Location: United States.</p>	<p>Subjects were participants in the Health Professionals Follow-up Study.</p> <p>Participants reported their weight on each biennial questionnaire, and weight change was defined as the difference between weight reported in 2002 and at baseline in 1992.</p> <p>Breakfast consumption was</p>	<p>Breakfast consumption was inversely associated with the risk of 5kg weight gain after adjustment for age (HR=0.77, 95% CI 0.72-0.82), and this association was independent of lifestyle and BMI at baseline (HR=0.87, 95% CI 0.82-0.93).</p>


Rating: 		consumption was assessed using a semi-quantitative FFQ.	The inverse association between breakfast consumption and weight gain was more pronounced in men with a baseline BMI of $\leq 25\text{kg/m}^2$ (HR=0.78, 95% CI 0.70-0.87), than in men who were overweight at baseline (HR=0.92, 95% CI 0.85-1.00).
--	--	---	--


## Research Design and Implementation

For a summary of the Research Design and Implementation results, [click here](#).


## Worksheets


 [Crossman A, Anne Sullivan D, Benin M. The family environment and American adolescents' risk of obesity as young adults. Soc Sci Med. 2006 ;63\(9\):2255-67.](#)

 [Merten MJ, Williams AL, Shriver LH. Breakfast consumption in adolescence and young adulthood: parental presence, community context, and obesity. J Am Diet Assoc. 2009 Aug;109\(8\):1384-91.](#)

 [Niemeier HM, Raynor HA, Lloyd-Richardson EE, Rogers ML, Wing RR. Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. J Adolesc Health. 2006 Dec;39\(6\):842-9. Epub 2006 Sep 27.](#)

 [Nooyens AC, Visscher TL, Schuit AJ, van Rossum CT, Verschuren WM, van Mechelen W, Seidell JC. Effects of retirement on lifestyle in relation to changes in weight and waist circumference in Dutch men: a prospective study. Public Health Nutr. 2005 Dec;8\(8\):1266-74.](#)

 [Purslow LR, Sandhu MS, Forouhi N, Young EH, Luben RN, Welch AA, Khaw KT, Bingham SA, Wareham NJ. Energy intake at breakfast and weight change: Prospective study of 6,764 middle-aged men and women. Am J Epidemiol. 2008 Jan 15; 167 \(2\): 188-192. Epub 2007 Dec 12.](#)

 [van der Heijden AA, Hu FB, Rimm EB, van Dam RM. A prospective study of breakfast consumption and weight gain among US men. Obesity \(Silver Spring\). 2007 Oct; 15\(10\): 2,463-2,469.](#)